SEAR JIP – The value of sharing of lessons learned on subsea integrity and reliability

Agenda

1 – Overview

2 – Challenges

3 – SEAR Reliability Database

4 – SEAR Testing Program

5 – Outlook

Overview

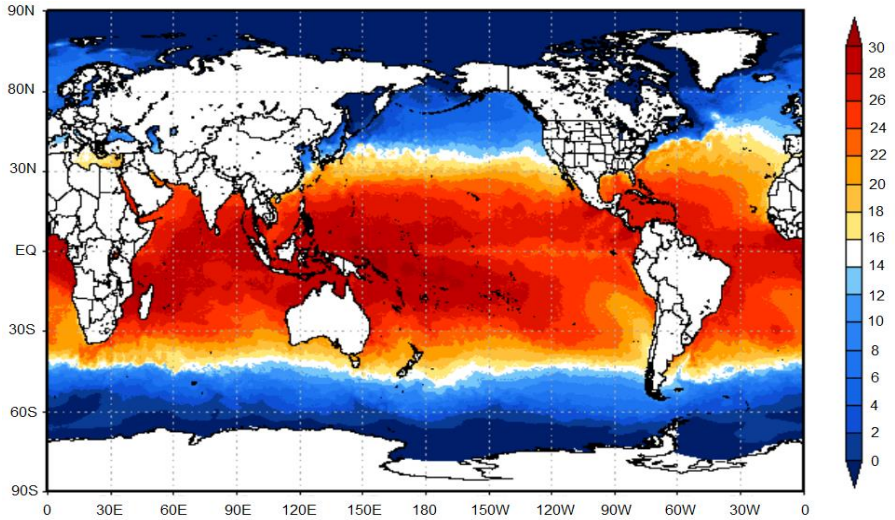
6 Operators participating on Phase V of the SEAR JIP:

Goal: Reduce subsea equipment failures through collaboration and knowledge sharing.

Overview – The Environment

The Environment:

- High sea water temperatures
- High nutrient environment
- High currents
- Cyclones



Overview – Intervention Issues

SEAR Reliability Database

Vision: Low cost / high value method of capturing, sharing failures and lessons learnt for Australia.

- Collection of asset and failure information
  - Anonymization of results
- Reliability Dashboard
  - Presentation of reliability data to permit comparison with other industry data sources (i.e. OREDA)
- Lessons Learned information incorporated into the SEAR Database

SEAR SEAR JIP wood.

Reliability Report for Subsea Equipment in Australian Waters

Client: XXXX Date Issued: 9/07/2018

Asset and Failure Event Summary

Table below shows the number of assets (Umbilicals, SCMs and EFLs) and failures for all operators.

Asset Type	No. Assets	No. Events
EFLs	384	1
SCMs	176	89
Umbilicals	93	25
Total	653	115

Table below summarises the Mean Time to Repair (MTTR) and Mean Time to Failure (MTTF) per asset for all operators.

Asset Type	MTTF (Yr)	MTTR (h)
EFLs	3.811	24.00
SCMs	3.215	37.80
Umbilicals	2.853	184.33

Table below shows the total number of XXX assets (Umbilicals, SCMs and EFLs) and failures.

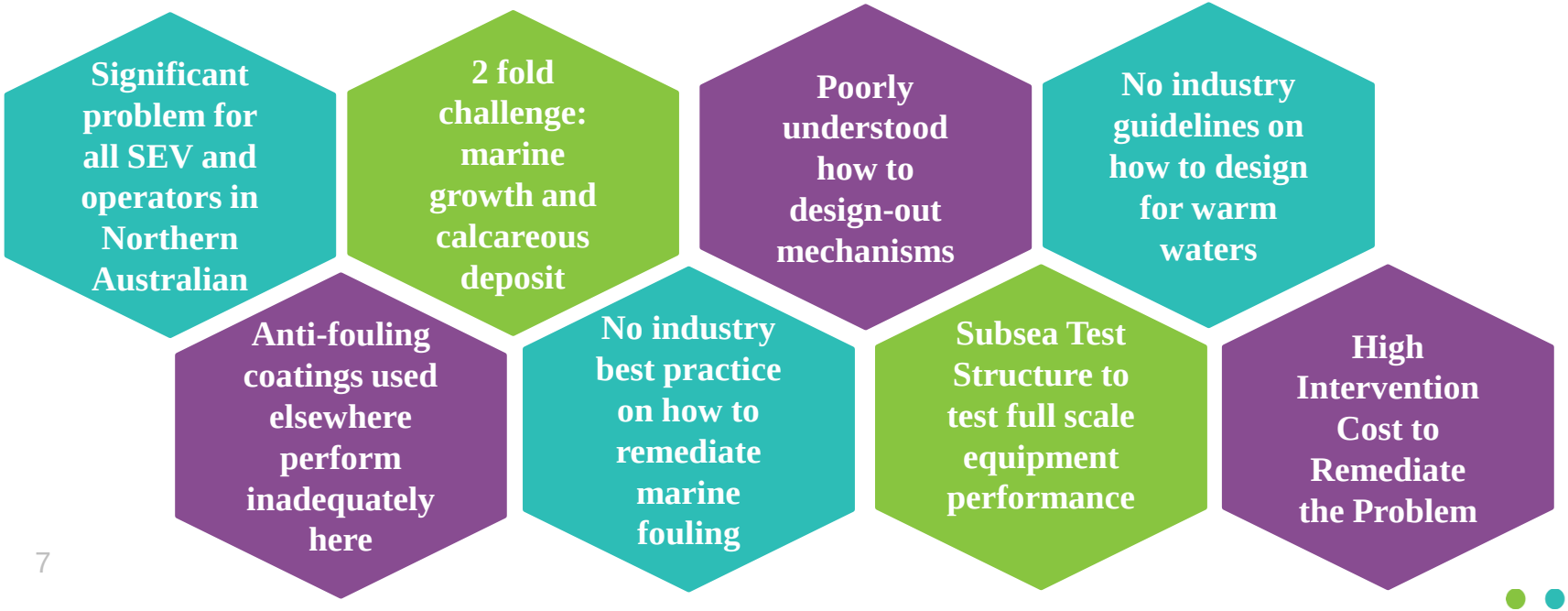
Asset Type	No. Assets	No. Failures
EFLs	15	1
SCMs	9	7
Umbilicals	7	3
Total	31	11

Table below summarises the Mean Time to Repair and Mean Time to Failure on XXX assets.

Asset Type	MTTF (Yr)	MTTR (h)
EFLs	3.811	24.00
SCMs	0.835	37.80
Umbilicals	0.765	184.33

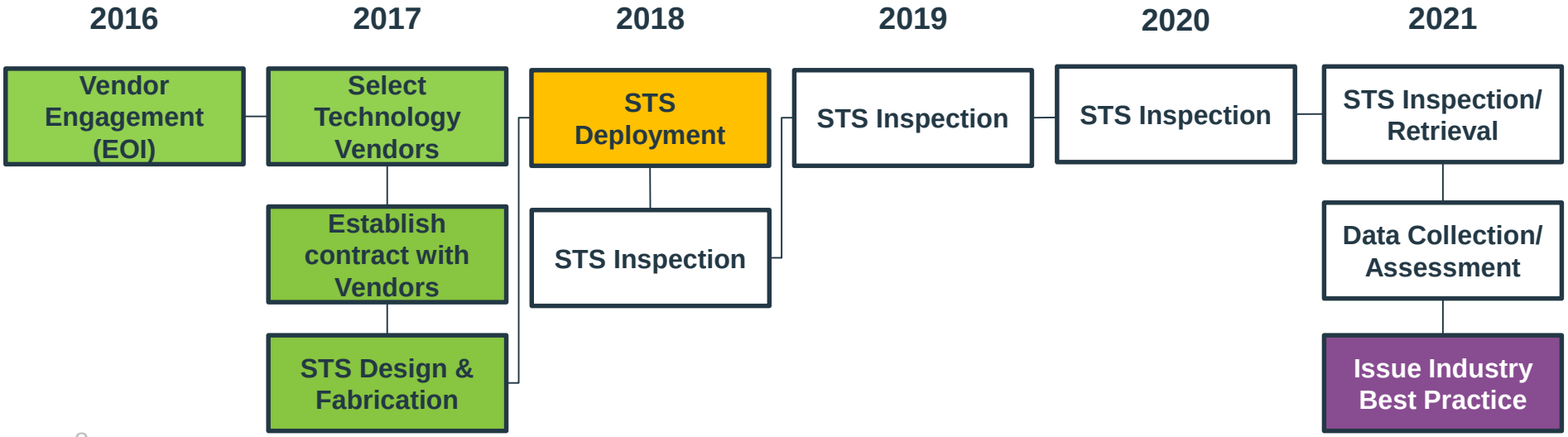
SEAR Testing Program

Problem: Unwanted marine fouling in subsea structures: significant interventions cost



SEAR Testing Program - STS Delivery Roadmap

- Transforming Australia Subsea Equipment Reliability (TASER) ➔ Subset of the SEAR JIP
- Collaborative industry effort, across operators, universities and suppliers, to address the root causes of marine fouling challenges.
- Testing Program will deploy game changing technology in 'living laboratories'.



*TASER – funds awarded by NERA

SEAR Testing Program

Suppliers collaborating with the Test Program:

BAKER HUGHES a GE company

OneSubsea A Schlumberger Company

TechnipFMC

walther präzision Quick Coupling Systems

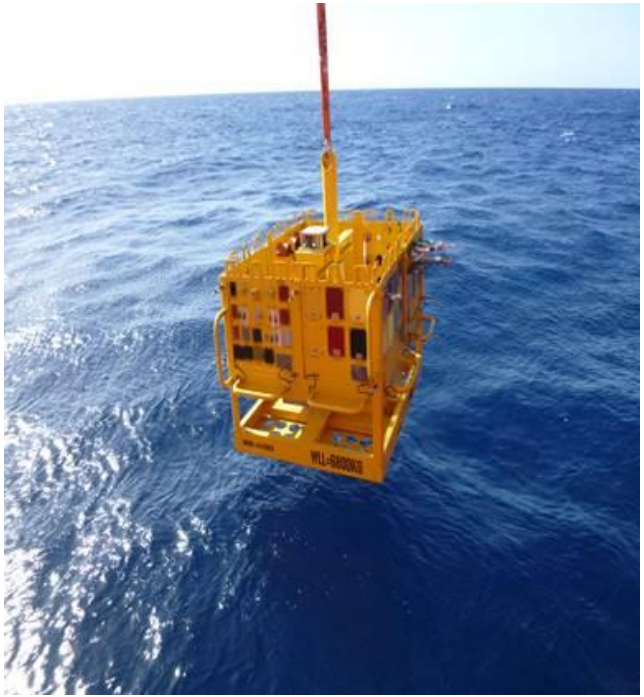
TELEDYNE MARINE Everywhereyoulook™

SIEMENS

TE connectivity

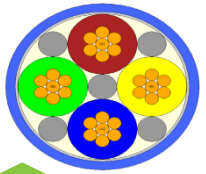
Vision:

- Lessons learned on the testing program will be shared back to vendors, enabling equipment reliability issues to be designed out.
- Over 100 samples loaned to be tested on STS.
- STS will be underwater for at least 3 years.
- Issue Best Practice Guideline on Marine Fouling



SEAR Testing Program

Problem: Unwanted gas in controls systems; a source of loss of insulation resistance?



- Significant problem for all SEV and operators in Northern Australian
- Poorly understood mechanisms and origins of gas evolution
- Poorly understood long term effects of gas presence on performance
- Gas presence thought to be the cause of electrical termination failures
- High Intervention Cost to Remediate the Problem

Umbilical Test Program Roadmap

2018

Issue RFP to Research Institutions
Desk top analysis to determine the possible cause(s) of gassing and fluid migration in subsea controls umbilicals

2019

Test Program
Perform cost effective tests to verify the plausible cause(s) of subsea umbilical cable gassing, fluid ingress and migration and performance impact

Outlook

- **COLLABORATIVE** effort across large group of Australian Subsea System Operators.
- **COLLECTION** of reliability data for Australian operations.
- Marine Fouling Mitigation and Remediation: Findings will be consolidated into **INDUSTRY BEST PRACTICE GUIDELINE**.
- Umbilical Performance Test: Findings will allow **DESIGN-OUT** gas migration challenge.

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